

REMARKS

Reconsideration of the rejections applied to Claims 1-2, 4-7 and 9-18 in light of the following remarks is respectfully requested. This Amendment address the rejections set forth in the Office Action dated September 11, 2002.

Independent Claim 19 has been added to advance prosecution of this case and make clear that applicants' method for the bleaching of chemical pulp is directed to a post bleaching step that occurs outside of the bleach plant. This is in sharp contrast to the teachings of the references applied in the rejections of record which are directed to integrated bleaching sequences at a bleach plant. Support for the amendment to Claim 18 is found in the specification at page 6, line 32 to page 7, line 10.

In one aspect (Claim 1), applicants' invention as claimed is directed to an improvement in a method for the bleaching of chemical pulp, wherein the pulp is treated in a plurality of different steps and wherein at least in one step a bleaching solution which contains a peracid is used. The improvement claimed in the method is using the peracid in a post-bleaching which is the last step of the bleaching process, the post-bleaching taking place in the presence of one or several earth-alkali metal compounds, the pH of the post-bleaching solution is in the range of 3-8, and the kappa number of the pulp before the post-bleaching with a peracid is at maximum 4.

In another aspect (Claim 19), applicants' invention as claimed is directed to a method for the bleaching of chemical pulp. The method comprises treating the pulp in a sequence of different steps at a bleach plant, transferring the treated pulp outside the bleaching plant and subjecting said treated pulp to a post-bleaching step outside the bleach plant in a pulp flow pipe during transfer of the pulp, in a storage tower or at a paper mill. The post-bleaching is ..

applied to a pulp having a kappa number at maximum 4 and comprises use of a bleaching solution containing peracid and having a pH within the range of 3-8, in the presence of one or several earth-alkali metal compounds. The peracid turns colorless chromophoric groups in the pulp.

Post-bleaching is applied to pulp for which the delignification process proper in a bleach-plant is already finished. A high degree of delignification, a high brightness and a low kappa number are attained by applicants' claimed method. The purpose of post-bleaching is to compensate for the decrease of brightness and thereby avoid the need of overbleaching in the delignification process. Overbleaching is disadvantageous because it results in a high consumption of chemicals. Post-bleaching is carried out outside the bleach plant in a pulp flow pipe or a storage tower or at a paper machine.

Applicants' claimed invention is directed a method for the bleaching of chemical pulp in which peracid is used in combination with at least one earth-alkali metal compound in the post-bleaching step that takes place outside of the bleach plant. The claimed method brings about an increase of brightness while the use of the earth-alkali metal compound effectively counteracts the adverse effect peracid alone would have on the viscosity and strength of the pulp. This has been shown in the working examples.

Claims 1-2, 4-7 and 9-16 have been rejected under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 3,865,685 to Hebbel et al., in view of WO 97/45586 with or without U.S. Patent No. 4,222,819 to Fossum et al. The primary reference, Hebbel et al., is clearly deficient. The Office Action argues that Hebbel et al. describe 3-stage and 5-stage (in Example VIII) bleaching sequences starting with, e.g., peracetic acid and ending with a final post-bleaching stage with use of a per compound.

However, the per compound that Hebbel et al. state is preferred and which they describe in the examples is hydrogen peroxide, not peracetic acid. Hebbel et al.'s teaching of bleaching with hydrogen peroxide in NaOH under strongly alkaline conditions does not teach or suggest applicants' claimed method in which the final post-bleaching step is carried out with a peracid within a pH range of 3-8. Hebbel et al. teach a bleaching solution containing besides hydrogen peroxide also 1.0% of NaOH. Such a solution is strongly alkaline, having a pH well above 8. Hebbel et al., therefore, do not teach or suggest post-bleaching with peracid in acidic or neutral conditions as specified by the claimed pH range of 3 to 8.

The Office Action argues that even though Hebbel et al. uses hydrogen peroxide and not per acids in the examples, "the disclosure of a reference is not limited to its Examples" and Hebbel et al. "clearly teach that per acids could be used as a substitute for the hydrogen peroxide" (Office Action dated September 11, 2002, p.4). Hebbel et al.'s inclusion of some per acids in a listing of per compounds (col. 2, lines 30-43) does not teach or suggest their use in a final bleaching step as a substitute for hydrogen peroxide. No competent chemist would consider using peracid instead of hydrogen peroxide for the final bleaching step because Hebbel et al. teach that such step is carried out under strong alkaline conditions. Peracid would require an acidic or neutral pH range, which would be contrary to the teachings of Hebbel et al. regarding their final bleaching stage. Hebbel et al. make a general teaching to having an alkaline final step at column 1, line 63, and exemplify such general teaching in their examples, wherein each time hydrogen peroxide is used for the final bleaching step, the conditions are strongly alkaline.

Moreover, Hebbel et al. state that "The amount of per compound added can be between 0.5 and 10 weight percent, preferably between 0.5 and 6 weight percent, calculated as 100 percent hydrogen peroxide and based on the oven dry calculated weight of the cellulose

used.” (column 2, lines 45-49). This does not teach or suggest using peracid in the post-bleaching step, for example, in an amount between 0.5 and 3 kg/tp as specifically claimed by applicants in Claim 13. Applicants have surprisingly found that even when using “a very small peracetic acid dose, 0.5-3 kg/tp, the results of applicants’ method are obtained, and that larger doses are even detrimental. See applicants’ specification at page 4, lines 23-28.

The Office Action also argues that Hebbel et al. “further teaches that a magnesium sulphate (alkaline earth compound) can be used as a complex builder or stabilizer.” Office Action dated September 11, 2002, p. 2. However, the disclosed use of an earth alkali metal compound in the Hebbel et al. bleaching process is general and vague. There is no specific teaching of use of an earth alkali metal compound in a final peracid post-bleaching step, much less a teaching of such bleaching in neutral or acid conditions, applied to a pulp having a kappa number of 4 or less.

The Office Action further argues that the teaching in Example VIII of Hebbel et al. of bleaching pulp in a 5-stage bleaching processes is properly combinable with, and can be interpreted in light of, the teaching in Example VII of Hebbel et al. that after four stages of the Hebbel et al. bleaching process, “the brightness is over 90% MgO (Example VII).” Office Action dated September 11, 2002, p. 2. From the teaching that the first 4 stages of the bleaching process described in Example VII produce a pulp with a brightness over 90% MgO, the Office Action concludes that “It would have been obvious to the routineer that after the first 4 stages of [the bleaching process described in Example VIII of] HEBBEL the brightness [of the pulp] would be above 85% ISO and [the pulp would have] a kappa number less than 4 as HEBBEL teaches that after 4 stages the brightness is over 90%” (Office Action dated September 11, 2002, p. 2).

However, the Office Action's argument that the first four stages would obviously produce a kappa number less than 4 is simply an unsupported assertion. The conclusions of the Office Action are based on the incorrect premise that the teachings of Examples VII and VIII of Hebbel et al. are properly combinable in the manner done by the Office Action. They are not. The first four stages of the bleaching process described in Example VIII of Hebbel et al. are markedly different from the first four stages of the bleaching process described in Example VII of Hebbel et al. Thus, they are not properly combinable in the manner done in the Office Action. Moreover, there is no description in either Example VII or VIII of Hebbel et al. of a bleaching process for pulp subjected to a final peracid post-bleaching step that produces a pulp having a kappa number of 4 or less, (Claim 1), much less a final peracid post-bleaching step outside the bleach plant that produces a pulp having a kappa number of 4 or less (Claim 19). Neither Example VII or VIII of Hebbel et al. teaches or suggests a bleaching process as claimed by applicant that produces a pulp having a kappa number of 4 or less.

Kappa number and brightness are two different parameters of pulp, which in principle do not depend on each other. Kappa number is a measure of the degree of delignification of a pulp, whereas brightness is merely a matter of its color. Even though a decreasing kappa number usually brings about an increasing brightness, there are other ways to increase brightness than delignification, and brightness can change with time. Consequently, brightness is not an adequate basis for gauging the kappa number with any certainty. Furthermore, applicants' invention as claimed required that the kappa number of 4 or less has been reached before the final peracid post-bleaching step. There is no teaching or suggestion of such in Hebbel et al.

The Office Action argues that "Applicant has not compared the kappa No. of the

pulp entering the peracid stage of HEBBEL to that of the instant process” (Office Action dated September 11, 2002, p.5). This argument is misplaced. Implicit in this argument is the unsupported assertion that Hebbel et al. inherently disclose a kappa number 4 or less before the final bleaching stage. The obviousness rejection applied to the claims here relies on a combination of references and the motivation to combine them depends on what they unequivocally teach or suggest, not on speculation as to their possible hidden contents. The Office Action attempts to overcome this deficiency by arguing that because it is known that “Conventional Kraft paper has a Kappa No. of 10-14,” and that “chlorine dioxide lowers the Kappa No.,” “the chlorine dioxide steps of HEBBEL would lower the Kappa No. in each of the stages” (Office Action dated September 11, 2002, p.5). But this argument does not establish or even suggest that the kappa number is reduced to 4 or less from an initial number of 10-14 by the Hebbel et al. bleaching sequences.

Accordingly, the Office Action’s argument improperly attempts to place onto applicants the burden of proving, by reproducing examples of Hebbel et al., that Hebbel et al. do not disclose a kappa number 4 or less before the bleaching stage. This is not a situation where a reference suggests applicants’ claimed invention. Rather, here the comparative testing is being required of applicants by the Office Action to show whether Hebbel et al. would qualify for obvious combination with other prior art. This is clearly improper.

The Office Action further argues that “It would have been obvious to bleach the pulp at any point where pulp is normally bleached, e.g. flow pipe, storage tower or on the paper machine (Office Action dated September 11, 2002, p.2). Post-bleaching in a flow pipe or storage tower, or on the paper machine are the subject matter of Claims 9-11. These are the specific locations for the post-bleaching according to applicants’ invention. Hebbel et al. do not refer to

such separately performed final bleaching in any manner whatsoever. Rather, Hebbel et al. describe only bleaching that is performed in an ordinary bleach plant. Claims 9-11 in particular are remote from Hebbel et al. as well as the other references cited in the Office Action. Applicants' invention improves post-bleaching performed separately outside the sequential bleaching that is performed in an ordinary bleaching plant. Thus, it would not be obvious to modify the teachings of Hebbel et al. to bleach the pulp in a flow pipe, storage tower or on a paper machine without applying hindsight gleaned from applicants' disclosure which is improper.

As regards "complete" bleaching accordingly to Hebbel et al. and post-bleaching, the Office Action's argument that "the last per-stage of HEBBEL would be a "post-bleach" stage as it comes after the other bleaching stages" (Office Action dated September 11, 2002, p. 4) only highlights the difference between applicants' invention as claimed and the bleaching described by Hebbel et al. Hebbel et al.'s complete bleaching is a close sequence of subsequent steps typically performed at a bleach plant. Such a sequence achieves a high degree of delignification, that is a low kappa number, as well as a high brightness. Hebbel et al. teach that nothing more needs to be done for the pulp. However, after such "complete" bleach, the brightness of the pulp may lower during storage, and post-bleaching is a measure taken to remedy this. Post-bleaching is typically carried out separately after the pulp has left the bleaching plant, and works by turning the pulp's chromophoric groups colorless rather than reducing the already very low residual lignin in the pulp. This is a clear difference from the cited references, which teach use of per compounds specifically for removing lignin from the pulp. See applicants' specification at page 4, lines 13-21. Moreover, Claims 17-18 specifically recite that the peracid is used to turn colorless chromophoric groups in the pulp in the post-bleaching step and new Claim 19 makes it

clear that the post-bleaching step takes place outside of the bleach plant.

The teaching of the secondary reference, WO 97/45586, does not cure the above stated deficiencies of the primary reference, Hebbel et al. WO 97/45586 describes a peracid step in the pH range of 4-8, but this step is not a post-bleaching step as there is always a subsequent alkaline step closing the bleaching sequence. According to the tables, the pH of the final alkaline step is within the range of 9-11. Considering that Hebbel et al.'s final peroxide step is always alkaline through the use of strong NaOH, there is nothing to suggest turning the final steps to the acidic or neutral pH range, i.e., to a pH of 8 or less.

Furthermore, WO 97/45586 nowhere applies peracid bleaching to pulp having a kappa number of 4 or less. The initial kappa numbers in WO 97/45586 are always higher, namely 4.9 or 5.6 according to tables 5 and 6. There are lower kappa numbers mentioned in the tables, but these are values resulting from the peracid step, and are not initial values. This does not teach or suggest applicants' claimed invention as claimed in which the kappa number is required to be at maximum 4 before the final post-bleaching. Thus, WO 97/45586 does not supply the deficiencies of Hebbel et al. and their combination does not teach or suggest applicants' invention as claimed in Claims 1-2, 4-7 and 9-16.

Moreover, the combination of Hebbel et al. and WO 97/45586 does not teach or suggest a bleaching process in which the amount of peracid used for post-bleaching is 0.5 to 3 kg/tp, as claimed by applicants in Claim 13. For example, in WO 97/45586, the amount of peracid used for post-bleaching is always at least 5 kg/tp. For these reasons, applicants respectfully submit that Claims 1-2, 4-7 and 9-16 define patentable subject matter over the combined teachings of Hebbel et al. and WO 97/45586. Withdrawal of the rejection of such claims under 35 U.S.C. §103(a) as obvious over Hebbel et al. in view of WO 97/45586 is

respectfully requested.

Claims 1-2, 4-7 and 9-16 also have been rejected under 35 U.S.C. §103(a) as being unpatentable over Hebbel et al. in view of WO 97/45586 , and further in view of U.S. Patent No. 4,222,819 to Fossum et al. The deficiencies of the primary references, Hebbel et al. and WO 97/45586, are set forth above. Fossum et al. do not cure these deficiencies. Fossum et al. has been cited as describing the use of certain calcium salts instead of magnesium salt (Office Action dated September 11, 2002, p.3). For the reasons set forth above, Claims 1-2, 4-7 and 9-16, as well as Claims 17-18 are believed to define patentable subject matter. Withdrawal of the rejection applied to Claims 1-2, 4-7 and 9-16 under 35 U.S.C. §103(a) as being unpatentable over Hebbel, et al. in view of Fossum, et al. is respectfully requested.

Claim 17 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Hebbel in view of WO 97/45586 as applied to Claim 1, and further in view of U.S. Patent No. 5,656,130 to Ali (newly cited). The deficiencies of Hebbel et al. and WO 97/45586 have been set forth above. Ali does not cure these deficiencies. Ali does not teach or suggest a final bleaching step applied to chemical pulp having a kappa number 4 or less before the final bleaching step. Nor does Ali teach or suggest the use of peracetic acid (Claim 5). Ali describes a final bleaching process step which converts remaining chromophoric groups in lignin into colorless derivatives. At the same time, this step is still described primarily as a lignin removal step. Significantly, the pulp is not taught to be transferred to another location outside the bleach plant before the final step. Instead, a bleach plant is specifically mentioned as the location for the invention, i.e., the entire bleaching process, see column 5, line 48 of Ali. Thus, Ali does not cure the deficiencies of Hebbel et al. and WO 97/45586 and its combination therewith does not teach or suggest applicants' Claim 17. Withdrawal of the rejection applied to Claim 17 under 35

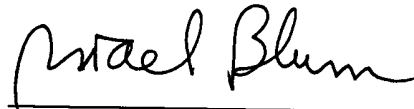
U.S.C. § 103(a) as unpatentable over Hebbel in view of WO 97/45586 and Ali is respectfully requested.

Former Claim 18 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Hebbel et al. in view of WO 97/45586 and Ali as applied to Claim 17, and further in view of Fossum et al. [Sic U.S. Patent No. 2,822,236 to Sheldon et al. (newly cited)]. The deficiencies of Hebbel et al., WO 97/45586 and Ali have been set forth above. Sheldon et al. does not cure these deficiencies. Claim 18 is directed to method wherein chemical pulp that has been bleached at a bleach plant to a kappa number of 4 or less is then subjected to post-bleaching. The post-bleaching of the already highly delignified pulp (as indicated by its low kappa number) occurs outside the bleach plant in a flow pipe, a storage tower or a paper mill.

All the references, Hebbel et al., WO 97/45586, Ali and Sheldon et al. describe integrated bleaching sequences at a bleach plant. Thus, their teaching essentially differ from the applicants' method as claimed in Claim 18 and in new Claim 19. Sheldon et al. describe the making of a brightness-stable pulp to avoid brightness loss during storage or shipping. The final bleaching stage is an integrated part of the bleaching proper, not a post-bleaching after the highly delignified pulp has been removed from the bleach plant, that is during transfer or in a separate storing tower for instance. The approach by Sheldon is thus opposite to and does not teach or suggest, alone or in combination with Hebbel et al., WO 97/45586 and Ali, the method claimed by applicants in Claim 18 and in new Claim 19. Withdrawal of the rejection applied to former Claim 18 under 35 U.S.C. § 103(a) as unpatentable over Hebbel et al. in view of WO 97/45586 and Ali and Sheldon et al. is respectfully requested.

In light of the foregoing, applicants respectfully submit that Claims 1-2, 4-7 and 9-18 and new Claim 19 define patentable subject matter over the prior art of record, alone or in combination. An allowance of all claims is earnestly solicited.

Respectfully submitted,



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